

U.S.S.N. 10,813,785

Remarks

Thorough examination by the Examiner is noted and appreciated.

The claims have been amended to further clarify Applicants disclosed and claimed invention.

Support for the amendments is found in the original claims including in the Specification:

No new matter has been added.

For example, see paragraph 0018 in the Specification:

"In accordance with these and other objects and advantages, the present invention is generally directed to a novel process for reducing the formation of potential device-contaminating particles in a process chamber, particularly an etch chamber or a pre-clean chamber used to pre-clean substrates prior to a PVD or other process. The process chamber conventionally includes multiple antennae, the purpose of which is to conduct bias power from a bias power source to a substrate supported on a pedestal assembly. According to the process of the invention, the antennae are removed from the pedestal assembly. **Accordingly, the**

U.S.S.N. 10,813,785

antennae, no longer present in the chamber during substrate processing, are capable of neither generating potential device-contaminating particles nor causing electrical arcing between the pedestal assembly and the chamber wall or other elements in the process chamber, leading to operational power loss. The Cp yield data and WAT data of the process of the invention have been shown to be comparable with the Cp yield data and WAT data of the conventional pre-clean process. Furthermore, the process results in simpler and more effective and efficient periodic maintenance (PM) of the chamber and eliminates the possibility of antenna-induced malfunctioning during chamber operation."

Claim Rejections under 35 USC 103

1. Claims 1-6, 11, and 13-17 stand rejected under 35 USC 103(a) as being unpatentable over Applicants alleged admitted prior art in view of Matsumoto (US 2004/0011466).

Applicants discuss problems in the prior art with antenna provided in said pedestal assembly for conducting bias power at paragraphs 0010, and 0011:

"One of the problems associated with the conventional pre-clean chamber 10 is that the multiple antennae 42 are exposed to the interior of the chamber 10 through respective slots or windows (not shown) provided in the insulator

U.S.S.N. 10,813,785

36. While this facilitates accurate and stable measurements of the bias power applied to the pedestal 34 through the bias power supply 28, in the event that the antennae 42 are installed incorrectly in the insulator 36, an impedance mismatch may occur. As a result, plasma may produce a high reflective power in the chamber 10 and damage the antennae 42. The damaged antennae 42 serve as a major source of particles which may potentially contaminate devices being fabricated on the substrate 32.

Moreover, because each of the antennae 42 is typically held in place using a copper clip (not shown) which conducts electrical current between the pedestal 34 and the antenna 42, the antennae 42 may serve as conduits for electrical arcing between the pedestal 34 and the chamber wall 14. Such electrical arcing induces operational power loss and requires re-tuning of the source power supply 26 and/or the RF match network 30 to stabilize the operational power. Therefore, a process is needed for reducing the generation of potential device-contaminating particles and preventing electrical arcing in a pre-clean chamber during a substrate pre-clean process."

On the other hand, Matsumoto discloses antennae for producing supplying RF power into a process chamber (see Abstract) to ignite a plasma where the antennae (see item 10a) Figure 1A) are disposed between a top plate (item 3) and a substrate (item 2) supported on a pedestal (item 7) (see paragraph 0047; 0050, 0051). The antennae (10a) (electroconductive rods) of Matsumoto are disclosed to be insulated from the plasma by an insulating tube (item 10b) (see e.g., Figures 3-8; paragraph 0058). Matsumoto also disclose that the antennae are movable to change the plasma distribution in the chamber (see paragraph 0077).

Thus even assuming arguendo some motivation to combine the disparate teachings of Applicants discussion of the prior discussing problems presented by antenna provided in a pedestal

U.S.S.N. 10,813,785

assembly for conducting bias power with the teachings of Matsumoto who teach a completely different type of antenna for a completely different purpose (RF power for plasma generation) and in a completely different location (across the chamber above the substrate (pedestal), such combination does not produce Applicants disclosed and claimed invention.

"A process for reducing generation of particles in a process chamber having a pedestal assembly for supporting a substrate and **at least one antenna provided in said pedestal assembly for conducting bias power**, comprising the steps of:

removing said at least one antenna from said pedestal assembly; and

processing said substrate in said process chamber without said at least one antenna in said pedestal assembly."

Moreover, removing the **RF plasma generating antennae** of Matsumoto would render the apparatus of Matsumoto unsuitable for its intended purpose (generating a plasma).

"Finally, the prior art reference (or references when combined) must teach or suggest **all the claim limitations**. The teaching or suggestion to make the claimed combination and the

U.S.S.N. 10,813,785

reasonable expectation of success must both be found in the prior art, and **not based on applicant's disclosure.**" *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

"If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification." *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984).

2. Claims 7-12, and 18-20 stand rejected under 35 USC 103(a) as being unpatentable over Applicants alleged admitted prior art in view of Matsumoto, as applied above, and further in view of Chen (USPUB 2002/0072016).

Applicants reiterate the comments made above with respect to Applicants alleged admitted prior art in view of Matsumoto.

Even assuming *arguendo*, a proper motivation for combination, the fact that Chen discloses **that a bias power up to about 600 Watts to the process electrode (pedestal) during a plasma cleaning process** where the chamber may be a cleaning chamber and may be cleaned before or simultaneously with a substrate (see

U.S.S.N. 10,813,785

Abstract; Figures 6A and 6B; paragraph 0047, 0049, 0051}, does not further help Examiner in producing Applicants disclosed and claimed invention.

"Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure." *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Conclusion

Applicants note that the cited references, singly or in combination, do not produce Applicants disclosed and claimed invention and nowhere recognize or provide a solution to the problem that Applicants have recognized and solved by their disclosed and claimed invention, and therefore fail to make out a *prima facie* case of obviousness with respect to Applicants independent and dependent claims.

Applicants have amended the claims to clarify their disclosed and claimed invention and respectfully request

U.S.S.N. 10,813,785

favorable reconsideration by Examiner.

Based on the foregoing, Applicants respectfully submit that the Claims are now in condition for allowance. Such favorable action by the Examiner at an early date is respectfully solicited.

In the event that the present invention as claimed is not in condition for allowance for any reason, the Examiner is respectfully invited to call the Applicants' representative at his Bloomfield Hills, Michigan office at (248) 540-4040 such that necessary action may be taken to place the application in a condition for allowance.

Respectfully submitted,

Tung & Associates

Randy W. Tung
Reg. No. 31,311
Telephone: (248) 540-4040